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FORAMINIFERA OF THE GENUS EHRENBERGINA AND ITS SPECIES

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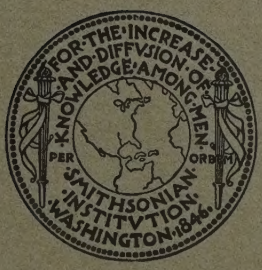

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FORAMINIFERA OF THE GENUS EHRENBERGINA AND ITS SPECIES[1]

By JOSEPH A. CUSHMAN
Of Sharon, Massachusetts

In 1850 Reuss erected the genus *Ehrenbergina* and for its genotype described the species *E. serrata* Reuss from the Miocene of Austria. *Ehrenbergina* is a genus related to *Cassidulina* and other genera of the calcareous group which have been included in the Textulariidae, in its biserial arrangement of the chambers but is clearly distinct in the peculiar plan of development. It is definitely known as far back as the Upper Eocene of America by a single species. Chapman has figured and described a form referred by him to *Ehrenbergina pupa* (d'Orbigny) from the Cretaceous of England, but it seems from the figure given to have very little relation to true *Ehrenbergina*.

It seems to be indicated that the genus may have been developed in American waters in the Upper Eocene and then became widely distributed in the Miocene at least. Records are very scattered and Reuss' species and one from Australia from the Miocene are the only ones from that formation and none are known from the Pliocene. There are a few records from the Pleistocene, all from the Pacific and Antarctic. As a recent genus it is well distributed in the Indo-Pacific and the tropical western Atlantic but most abundant in the Pacific. There are several distinct species in the present oceans with very definite distributions.

Genus EHRENBERGINA Reuss, 1850

Ehrenbergina REUSS (type *E. serrata* Reuss), Denkschr. Akad. Wiss. Wien, vol. 1 1850, p. 377.—H. B. BRADY, Rep. Voy. *Challenger*, Zoology, vol. 9, 1884, p. 433.—CHAPMAN, The Foraminifera, 1902, p. 179.—CUSHMAN, Bull. 71, U. S. Nat. Mus., pt. 2, 1911, p. 101; Bull. 104, pt. 3, 1922, p. 133.
Cassidulina (part) d'ORBIGNY, Foram. Amér. Mérid., 1839, p. 57.

Test free, composed of numerous chambers arranged biserially about an elongate axis with a definite dorsal and ventral side, the dorsal with the chambers meeting evenly and alternating, the surface usually smooth, the ventral side usually with a central groove and the

[1] This is the second of a contemplated series of revisions of the genera of Foraminifera by Dr. J. A. Cushman. The first appeared as No 2597, of the Proceedings of the United States National Museum, vol. 67, 1926, art. 25, pp. 1-24, with pls. 1-6: "Foraminifera of the Genera Siphogenerina and Pavonina."

chambers ornamented; test in transverse section roughly triangular, the ventral side forming two sides and the apex of a triangle; wall calcareous, perforate; aperture elongate, nearly at right angles to the edge of the chamber; surface smooth or ornamented with spines or ridges.

SPECIES FROM THE EOCENE

EHRENBERGINA SEMMESI, new species

Plate 1, fig. 1

Test small, in front view somewhat rhomboid; chambers few, distinct; sutures very slightly depressed on the ventral side, not at all so on the dorsal side; periphery with distinct, solid, acicular spines on the angles of the last four chambers; surface smooth except the margins of the last few chambers on the ventral side, which are thickened; test in section biconvex; aperture elongate.

Length 0.40 mm.; breadth with spines 0.50 mm.

Holotype (Cushman Coll. No. 1595) from Alazan Clay, km. 66 on Mexican Oil Fields R. R., Cazones River, Mexico, collected by D. R. Semmes.

This species has already developed the spinose character of the periphery, more strongly so than others until the Pleistocene and Recent species are seen.

SPECIES FROM THE MIOCENE

EHRENBERGINA SERRATA Reuss

Plate 1, figs. 2*a-c*

Ehrenbergina serrata REUSS, Denkschr. Akad. Wiss. Wien, vol. 1, 1850, p. 377, pl. 48, figs. 7*a-c*.

Test small, broadly ovate in front view, chambers numerous, mostly rather low and broad, increasing in height in the adult, sutures on the ventral side depressed, on the dorsal side flush with the surface; periphery serrate, the outer edge of the chamber thin and carinate with the posterior angle slightly produced; surface smooth; aperture elongate, slightly curved.

The types of this species are from the Miocene of Austria.

Many authors have referred specimens to this species of Reuss, but a comparison of the figures will show them to be very different.

SPECIES FROM THE PLEISTOCENE

EHRENBERGINA BICORNIS H. B. Brady

Plate 1, figs. 5*a*, *b*

Ehrenbergina bicornis H. B. BRADY, Quart. Journ. Geol. Soc., vol. 44, 1888, p. 5, pl. 1, figs. 3*a*, *b*.

"Test subspherical, regularly biserial, earlier portion helicoid; margin entire; armed with two stout spines, one at each side, directed outwards."

"This is a curious modification of the Cassiduline type, somewhat allied to *Ehrenbergina hystrix*, the short scattered spines of which are replaced by two long processes, one at each lateral margin, protruding at right angles to the longer diameter of the shell. The segmentation is exceedingly regular and the septal lines are scarcely, if at all, depressed."

This species was described from the Pleistocene of Suva, Fiji, and also recorded from New Ireland in the Bismarck Archipelago.

EHRENBERGINA FOVEOLATA Schubert

Plate 1, figs. 3, 4

Ehrenbergina foveolata SCHUBERT, Abhandl. geol. Reichsanst., vol. 20, pt. 4, 1911, p. 61, pl. 6, fig. 1*a-f*.

The figures of this species are from photographs of specimens taken out of the Pleistocene rock from the Bismarck Archipelago. They are generally triangular in front view with spinose projections, evidently more than one on a side and the striking character is the surface ornamentation which consists of fine polygonal reticulations.

Length 0.30–0.50 mm., breadth 0.50–0.60 mm.

The types are from Panaras and Suralil, Middle New Mecklenburg in the Bismarck Archipelago.

The species is evidently related to *E. bicornis* H. B. Brady, and *E. hystrix* H. B. Brady, but the surface ornamentation makes it very distinct from any other known species.

LIVING SPECIES

EHRENBERGINA HYSTRIX H. B. Brady

Plate 1, figs. 6*a*, *b*

Ehrenbergina hystrix H. B. BRADY, Quart. Journ. Micr. Sci., vol. 21, 1881, p. 60; Rep. Voy. *Challenger*, Zoology, vol. 9, 1884, p. 434, pl. 55, figs. 8–11.—FLINT, Bull. 55, U. S. Nat. Mus., 1905, pp. 16, 19.—CUSHMAN, Bull. 71, U. S. Nat. Mus., pt. 2, 1911, p. 102, text figs. 156*a–d*.—HERON-ALLEN and EARLAND, British Antarctic Exped., Zoology, vol. 6, 1922, p. 140.

Test about as broad as long; chambers few, periphery with a stout spine from the middle of each chamber, those of the earlier chambers of the coiled portion scattered over that part of the ventral surface; sutures on the dorsal side somewhat thickened but not elevated, on the ventral side depressed; wall thick and heavy; aperture elongated, curved, with numerous costae on the surface arranged in a radial manner about it.

Length up to 1 mm.

The type specimens are from the South Pacific. The known distribution is in the tropical Pacific from lat. nearly 140° W. to nearly 140° E., and extending barely beyond the Tropics. An exception to

spinose processes from the upper angle of each chamber extending straight out from the test, each chamber with the ventral angle having a raised ridge continuing to the spine at the periphery; aperture elongate, narrow.

Length up to 0.60 mm.

Brady's specimens referred to in the above reference were from *Challenger* station 192 off the Ki Islands. I have had the species from numerous stations in the Pacific where it is common.

EHRENBERGINA TRIGONA Goës

Plate 2, fig. 3

Textularia triquetra Goës (not von Münster), Kongl. Svensk. Vet. Akad. Handl., vol. 19, No. 4, 1882, p. 83, pl. 6, figs. 183, 184.

Ehrenbergina serrata Reuss, var. *trigona* Goës, Bull. Mus. Comp. Zoöl., vol. 29, 1896, p. 49.

Ehrenbergina trigona Cushman, Bull. 104, U. S. Nat. Mus., pt. 3, 1922, p. 135, pl. 26, fig. 4.

Test roughly triangular in front view, dorsal side slightly curved or plane, ventral side with or without a central furrow, the peripheral angles slightly spinose, the projections pointing downward; sutures distinct, not depressed on the dorsal side, only slightly so on the ventral side; the ventral angle of the chambers with a slight raised ridge; aperture elongate, curved.

Length 0.40 mm.

Ehrenbergina trigona Goës may be used for those specimens of the Western Atlantic which have a decided trigonal form, the slightly thickened edges to the chambers and the spinose projections pointing downward. It is represented off the coast of Brazil by the following variety:

EHRENBERGINA TRIGONA Goës, var. BRAZILIENSIS Cushman

Plate 2, figs. 4 *a*, *b*.

Ehrenbergina trigona Goës, var. *braziliensis* Cushman, Bull. 104, U. S. Nat. Mus., pt. 3, 1922, p. 136, pl. 26, figs. 1–3.

Test differing from the typical in having the test much more compressed, the whole being very thin and broad, the angles at the sides well developed and spinose, usually with numerous short spines below the main one at the angle, the early portion of the test often covered with numerous short spinose processes; wall rather coarsely perforate, test translucent.

The types of this variety (Cat. No. 16395, U.S.N.M.) are from off Brazil in 417 fathoms. The very flat form with peculiar roughened angles are distinctive.

EHRENBERGINA PUPA (d'Orbigny)

Plate 2, figs. 5, 6

Cassidulina pupa d'ORBIGNY, Foram. Amér. Mérid., 1839, p. 57, pl. 7, figs. 21–23.
Ehrenbergina pupa H. B. BRADY, Rep. Voy. *Challenger*, Zoology, vol. 9, 1884, p. 433, pl. 55, figs. 1*a*, *b*; pl. 113, figs. 10*a–c*.—CHAPMAN Journ. Linn. Soc. Zool., vol. 30, 1910, p. 406.—PEARCEY, Trans. Roy. Soc. Edinburgh, vol. 49, 1914, p. 1016.—CHAPMAN, Rep't. British Antarctic Exped., Geol., vol. 2, 1916 (1917), p. 31, pl. 2, figs. 15*a*, *b*.—CUSHMAN, Bull. 104, U. S. Nat. Mus., pt. 3, 1922, p. 137.

Test subtriangular, broader at the apertural end, bluntly pointed at the initial end, composed of comparatively few chambers, on the dorsal side smooth and rounded, the ventral side with a slight longitudinal depression; chambers inflated, distinct, wall fairly thin, finely punctate, smooth; sutures distinct, depressed, especially on the ventral side, not forming either spines or ridges; aperture elongate, curved, nearly at right angles to the edge of the chamber.

Length 0.35 mm.

D'Orbigny's types were from the Falkland Islands. There are rather wide spread records for the species but mostly from the South Atlantic and South Pacific.

It is very distinct from all the other species of the genus in its very smooth rounded test with the absence of all ornamentation. Egger's figures[5] do not at all correspond with the characters of this species. It may be noted that the original figures of d'Orbigny show a more compressed form than do later figures.

Chapman[6] refers specimens from the Lower Cretaceous to this species. There are, however, numerous points in which his figure does not fit well with what is known of *E. pupa* and it is to be questioned if it really represents an *Ehrenbergina*.

Chapman has recently referred[7] Upper Eocene specimens from New Zealand to this species. The figured specimen is not clear in all its details but hardly seems referable to this species as developed in the present ocean.

A further study with a larger suite of specimens of the form that I have referred to *E. glabrata* from the Byram Marl of Mississippi[8] shows it to belong to the peculiar group of *Gaudryina* in which there is a slight basal triangular portion followed by a later development in which as in *Ehrenbergina* there is developed a dorsal side that is flattened and a ventral one with deeply depressed sutures.

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[5] Abhandl. kön. bay. Akad. Wiss. München, Cl. II, vol. 18, 1893, pl. 7, figs. 43–46.
[6] Quart. Journ. Geol. Soc., vol. 50, 1894, p. 304, pl. 34, figs. 6*a*, *b*.
[7] New Zealand Geol. Surv., Pal. Bull. No. 11, 1926, p. 43, pl. 9, fig. 15.
[8] U. S. Geol. Survey Prof. Paper 129–E, 1922, p. 93, pl. 17, figs. 4*a–c*.

EXPLANATION OF PLATES

Plate 1

Fig. 1. *Ehrenbergina semmesi*, new species. Front view. × 60.

2 *a–c*. *Ehrenbergina serrata* Reuss. *a*, ventral view; *b*, side view; *c*, dorsal view. After Reuss, type figure.

3, 4. *Ehrenbergina foveolata* Schubert. 3, ventral view(?); 4, dorsal view(?) After type figures of Schubert. × 50.

5*a*, *b*. *Ehrenbergina bicornis* H. B. Brady. *a*, ventral view; *b*, dorsal view. After Brady's type figures. × 50.

6 *a*, *b*. *Ehrenbergina hystrix* H. B. Brady. *a*, ventral view; *b*, dorsal view. × 60. After Brady's type figures.

7, 8. *Ehrenbergina hystrix* H. B. Brady, var. *glabra* Heron-Allen and Earland. 5, ventral view; 6, apertural view. × 60. After originals.

9. *Ehrenbergina mestayeri* Cushman. Ventral view. × 60.

Plate 2

Figs. 1*a–c*. *Ehrenbergina bradyi* Cushman. *a*, ventral view; *b*, dorsal view; *c*, apertural view. × 60. After Brady.

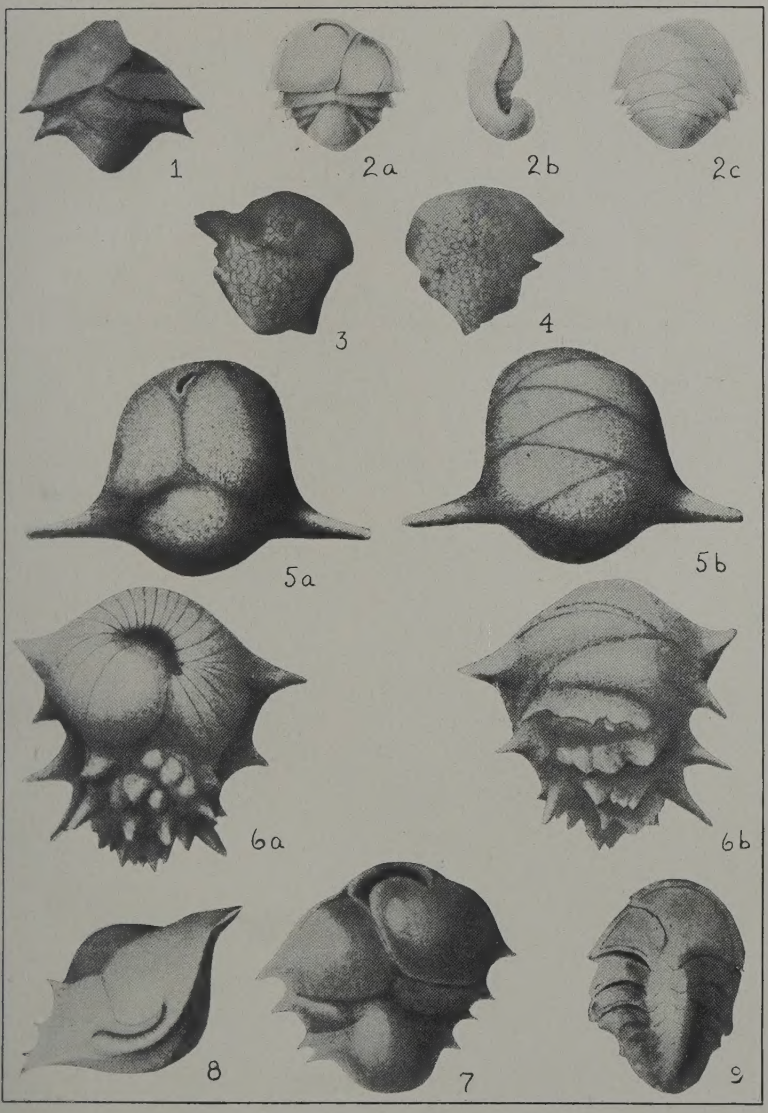
2*a–c*. *Ehrenbergina pacifica* Cushman, new species. *a*, ventral view; *b*, dorsal view; *c*, apertural view. × 60. After Brady.

3. *Ehrenbergina trigona* Goës. Ventral view. ×80. Young specimen.

4*a*, *b*. *Ehrenbergina trigona* Goës, var. *braziliensis* Cushman. *a*, ventral view; *b*, dorsal view. × 80.

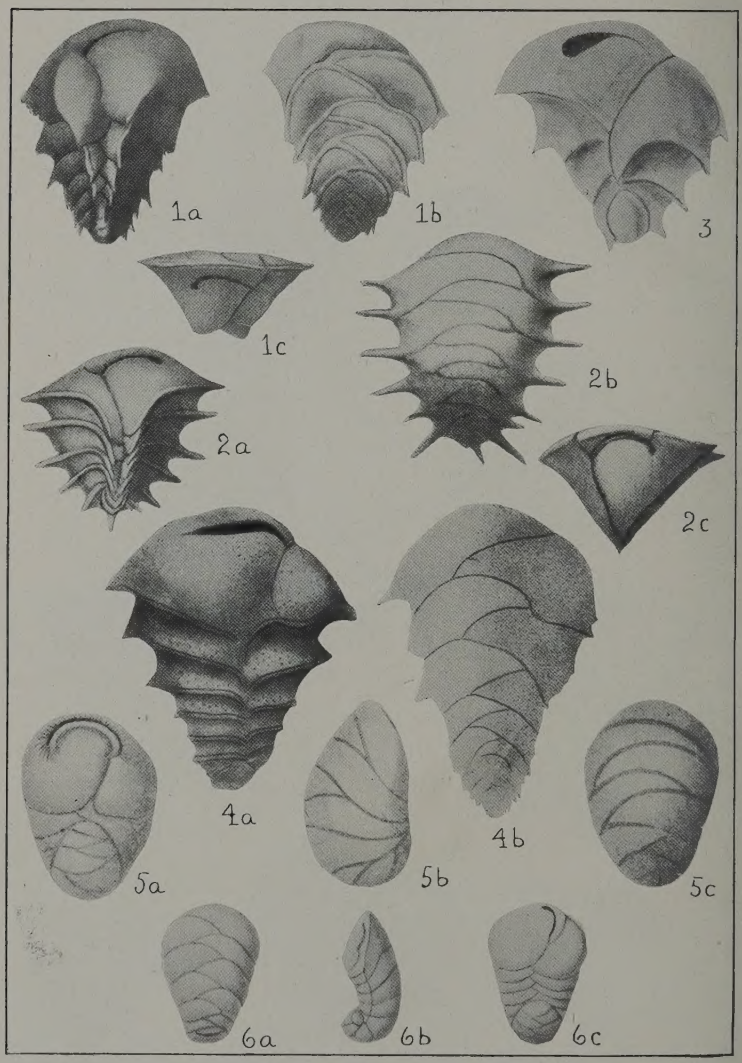
5*a–c*. *Ehrenbergina pupa* (d'Orbigny). *a*, ventral view; *b*, peripheral view; *c*, dorsal view. × 80. After Brady.

6*a–c*. *Ehrenbergina pupa* (d'Orbigny). *a*, dorsal view; *b*, peripheral view; *c*, ventral view. × 75. After d'Orbigny's type figure.



SPECIES OF THE FORAMINIFERA GENUS EHRENBERGINA

FOR EXPLANATION OF PLATE SEE PAGE 8



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